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Electrical, rheological and thermal study of dynamic behavior in glass forming liquids

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The electrical conductivity, the viscosity and the thermal behavior of melts and glasses in the Na_2O 2 SiO_2 system were measured in broad temperature range. The obtained data where analyzed with special focus to the non-Arrhenius behavior of the conductivity and the viscosity and the conductivity using the equation

$$\sigma = \sigma_0 \exp\left(\frac{-E_a}{k}\left(\frac{1}{t}\right)^f\right)$$

The deviation from the Arrhenius-behaviour i.e. fragility is quantified by the exponent f of the equation. The fragility of the Na_2O 2 SiO_2 system is discussed in therms of kinetics and thermodynamics.

The application of the 3 different methods will allow to experimentally access the universal dynamic behavior of melts and glasses in a broad temperature range. In contrast to viscosity measurements conductivity measurements allows to trace the iso-structure relaxation times at temperature below and above T_g using heating rates between 0.1 and 10 K/min. The interpretation allows a detailed description of the α and β relaxations in melts and glasses.